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C & R-PREP.

× INHERITANCE OF "Woolly" IN RABBITS ×

Almost everyone who has had experience in the production of domestic rabbits has occasionally seen long-haired, or "woolly," young in litters from normal-haired parentage. Not everyone knows, however, that the condition can be accounted for and controlled.

The woolly, or long-haired, rabbit that occurs in occasional litters is practically the same as the Angora rabbit, the chief difference being that the Angora rabbit has been purposely developed through careful selection and breeding. Feeding, season of year, condition of buck or doe, and similar factors have nothing to do with influencing the appearance of the character. The occurrence of woolly, or long-haired, individuals is due solely to inheritance.

When a woolly rabbit is mated with one that has normal hair, all the young have normal hair. All, however, carry the determiner, or gene, for woolly. The woolly condition, therefore, is what is known as a recessive character, and it may be carried and transmitted by normal-haired rabbits. If the young resulting from crossing normal-haired and woolly rabbits are mated, brother-sister, approximately one-fourth of their offspring will be woollies, about one-fourth will be entirely free from the character, and one-half will be normal-haired but carriers of woolly.

Woolly offspring can be produced only under the following conditions:

- (1) If both parents are woolly, or Angora--then all the offspring are woolly.
- (2) If both parents are normal-haired carriers of the gene, or determiner, for woolly--then one-fourth of the offspring are woolly and three-fourths are normal-haired.
- (3) If one parent is woolly and the other is a normal-haired carrier of the gene for woolly--then the offspring are about half woolly and half normal-haired.

If a normal-haired carrier of the gene for woolly is mated with a normal-haired noncarrier, the young will all be normal-haired, but half of them will be carriers of the gene.

SUGGESTIONS FOR THE ELIMINATION OF THE WOOLLY

The character, or gene, for woolly cannot be eradicated from the individual rabbit. To eliminate woolly from the rabbitry, mate animals so only normal-haired offspring will be produced; avoid breeding from carriers of the gene.

The occurrence of woollies in a litter from normal-haired parentage indicates that both the buck and doe are carriers of the gene. These should be eliminated from the rabbitry or else mated only to tested animals known to be noncarriers. The normal-haired offspring in the same litter should not be saved for breeding unless tested and found to be noncarriers of the gene.

A normal-haired rabbit is tested by mating with a woolly. If all the young are normal-haired and the litter numbers six or more, it is probable that the normal-haired parent is a noncarrier. If the animal is considered especially valuable, it would be well to repeat the test. If any woolly young are produced from a mating of normal-haired with woolly, the normal-haired parent is a carrier. (see 3)

In drawing conclusions from test matings, remember that if the litter is small only normal-haired offspring may appear, even though a fourth or half are expected to be woolly, as under conditions 2 or 3.

EXPLANATION OF THE OCCURRENCE OF WOOLLY

Hereditary characters are represented in the germ cells by determiners, called genes. In the accompanying graph symbols for these are as follows:

L(capital letter), gene for normal hair. l(small letter), gene for woolly hair.

In a mating of woolly and woolly, a sperm-carried gene unites with an egg-carried gene, so that in a formula the woolly is designated by two small l's (ll); likewise, the normal-haired is designated by two capital L's (LL), one letter representing the gene from the father, the other that from the mother. Matings are written as follows:

LL x LL	=	Normal buck x normal doe.
ll x ll	=	Woolly buck x woolly doe. (1)
LL x ll	=	Normal x woolly.
Ll x Ll	=	Normal-haired carriers of woolly. (2)
LL x Ll	=	Normal-haired x normal-haired carrier of woolly.
Ll x ll	=	Normal-haired carrier of woolly x woolly. (3)

In the mating of a normal-haired buck with a woolly doe (LL x ll), each sperm carries the gene L, each egg the gene l. Thus, the young from such a mating are designated Ll. They are normal-haired carriers, the normal-hair character (L) being dominant, while the woolly-hair character is recessive. When the Ll rabbits form germ cells, about half receive the L gene and about half the l gene. Both of the genes, whether LL, Ll, or ll, never get into the same ripe germ cell, so that a sperm or an egg can be either L or l. The entire cross can now be diagramed.

Normal-haired buck mated with woolly doe:

A diagram illustrating a monohybrid cross between two heterozygous pea plants. At the top, the cross is labeled $Ll \times Ll$. Below this, two circles represent the parent plants, each labeled with Ll . The left circle is also labeled "Sperm" and the right circle is labeled "Egg". Lines from the bottom of each parent circle converge at a point below the center, labeled ll , representing the homozygous recessive offspring. The entire diagram is enclosed in a rectangular box.

Diagram illustrating the inheritance of hair texture (Normal-haired vs. Woolly) based on the cross $LI \times LI$.

Gametes: Sperm (L, I) and Eggs (L, I).

Offspring Genotypes and Phenotypes:

- LL (1/4): Normal-haired noncarrier
- LI (1/4): Normal-haired carrier
- LI (1/4): Normal-haired carrier
- II (1/4): Woolly

Summary: 3/4 of the offspring are Normal-haired (1/4 noncarrier, 2/4 carrier), and 1/4 are Woolly.

Diagram illustrating a genetic cross between two heterozygous individuals ($Ll \times Ll$).

The cross is shown as:

$$Ll \times Ll$$

The gametes produced are L and l .

The resulting offspring genotypes are:

- LL (Normal-haired noncarrier, $\frac{1}{2}$)
- Ll (Normal-haired carrier, $\frac{1}{2}$)

The diagram illustrates a genetic cross. At the top, the parental generation is shown: a male (Sperm) with genotype Ll and a female (Egg) with genotype ll . The male's genotype is represented by a circle containing L and a wavy line, while the female's is a circle containing l and a wavy line. Lines from the male's circle lead to two possible gametes: L and l . Lines from the female's circle lead to two possible gametes: l and l . These gametes combine to form the offspring. The first offspring is labeled Ll and "Normal-haired carrier $\frac{1}{2}$ ". The second offspring is labeled ll and "Woolly $\frac{1}{2}$ ". A horizontal line separates the parental generation from the offspring.